

Homework 7 Solution

Section 7.1 ~ 7.2

7.1.36. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $X = \{2, 4, 6, 8\}$, $Y = \{2, 3, 4, 5, 6\}$, and $Z = \{1, 2, 3, 8, 9\}$. List the members of $X \cup Y$, using set braces.

$$\{2, 3, 4, 5, 6, 8\}$$

7.1.38. List the members of Y' , using set braces.

$$\{1, 7, 8, 9\}$$

7.1.40. List the members of $X' \cap Z$, using set braces.

$$X' = \{1, 3, 5, 7, 9\}$$

$$X' \cap Z = \{1, 3, 9\}$$

7.1.44. List the members of $(X \cap Y) \cup (X' \cap Z)$, using set braces.

$$X \cap Y = \{2, 4, 6\}$$

$X' \cap Z = \{1, 3, 9\}$ by #40. So

$$(X \cap Y) \cup (X' \cap Z) = \{1, 2, 3, 4, 6, 9\}.$$

7.1.66. The following table shows some symptoms of an overactive thyroid and an underachieve thyroid.

Underactive Thyroid	Overactive Thyroid
Sleepiness, s	Insomnia, i
Dry hands, d	Moist hands, m
Intolerance of cold, c	Intolerance of heat, h
Goiter, g	Goiter, g

Let U be the smallest possible set that includes all the symptoms listed, N be the set of symptoms for an underachieve thyroid, and O be the set of symptoms for an overactive thyroid. Find $N \cap O$.

$$N = \{s, d, c, g\}, O = \{i, m, h, g\}$$

$$N \cap O = \{g\}$$

7.1.68. Find $N \cap O'$.

$$U = \{s, d, c, g, i, m, h\}$$

$$O' = \{s, d, c\}$$

$$N \cap O' = \{s, d, c\}$$

7.1.78. In the following list of states, let $A = \{\text{states whose name contains the letter e}\}$, let $B = \{\text{states with a population of more than 4,000,000}\}$, and $C = \{\text{states with an area greater than 40,000 square miles}\}$.

State	Population (1000s)	Area (sq. mi.)
Alabama	4662	52,419
Alaska	686	663,267
Colorado	4939	104,094
Florida	18,328	65,755
Hawaii	1288	10,931
Indiana	6377	36,418
Kentucky	4269	40,409
Maine	1316	35,385
Nebraska	1783	77,354
New Jersey	8683	8721

(a) Describe in words the set $A \cup (B \cap C)'$.

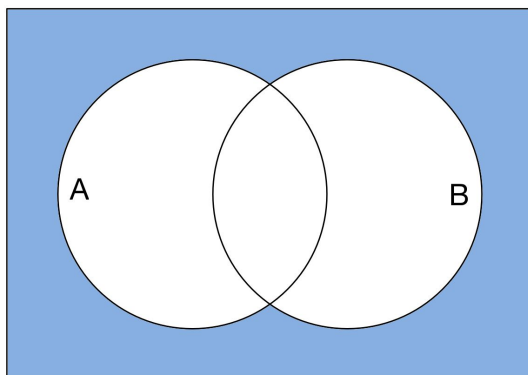
The set of states whose name contains the letter "e" or who are not both more than 4 million in population and more than 40,000 square miles in area

(b) List all elements in the set $A \cup (B \cap C)'$.

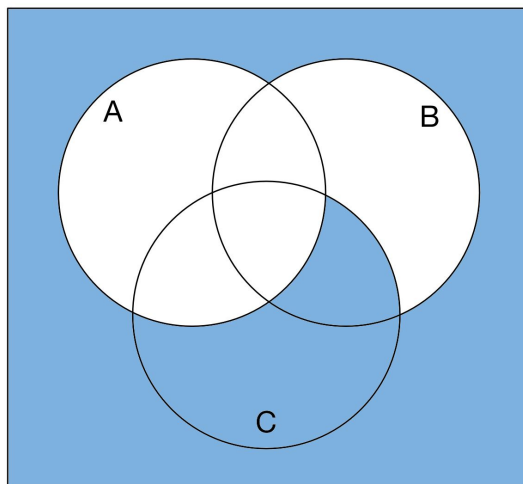
$$A \cup (B \cap C)'$$

$$= \{\text{Alaska, Florida, Hawaii, Indiana, Kentucky, Maine, Nebraska, New Jersey}\}$$

7.2.4. Sketch a Venn diagram like the one in the figure, and use shading to show $A' \cap B'$.



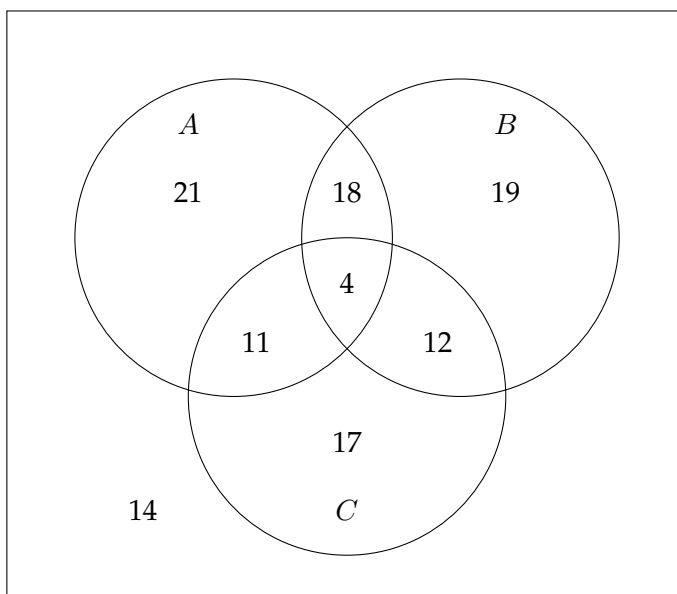
7.2.18. Sketch a Venn diagram like the one shown, and use shading to show $A' \cap (B' \cup C)$.



7.2.30. Draw a Venn diagram and use the given information to fill in the number of elements for each region.

$$n(A) = 54, n(A \cap B) = 22, n(A \cup B) = 85, n(A \cap B \cap C) = 4,$$

$$n(A \cap C) = 15, n(B \cap C) = 16, n(C) = 44, n(B') = 63$$



7.2.40. Market research showed that the adult residents of a certain small town in Georgia fit the following categories of cola consumption. (We assume here that no one drinks both regular cola and diet cola.)

Age	Drink			Totals
	Regular Cola (R)	Diet Cola (D)	No Cola (N)	
21-25 (Y)	40	15	15	70
26-35 (M)	30	30	20	80
Over 35 (O)	10	50	10	70
Totals	80	95	45	220

Using the letters given in the table, find the number of people in each set.

(a) $Y \cap R$

$$40$$

(b) $M \cap D$

$$30$$

(c) $M \cup (D \cap Y)$

$$80 + 15 = 95$$

(d) $Y' \cap (D \cup N)$

$$30 + 20 + 50 + 10 = 110$$

(e) $O' \cup N$

$$70 + 80 + 10 = 160$$

(f) $M' \cap (R' \cap N')$

$$15 + 50 = 65$$

(g) Describe the set $M \cup (D \cap Y)$ in words.

All people age 21-25 who drink diet cola or anyone age 26-35.

7.2.60. At a pow-wow in Arizona, 75 Native American families from all over the Southwest came to participate in the ceremonies. A coordinator of the pow-wow took a survey and found that

15 families brought food, costumes, and crafts;

25 families brought food and crafts;

42 families brought food;

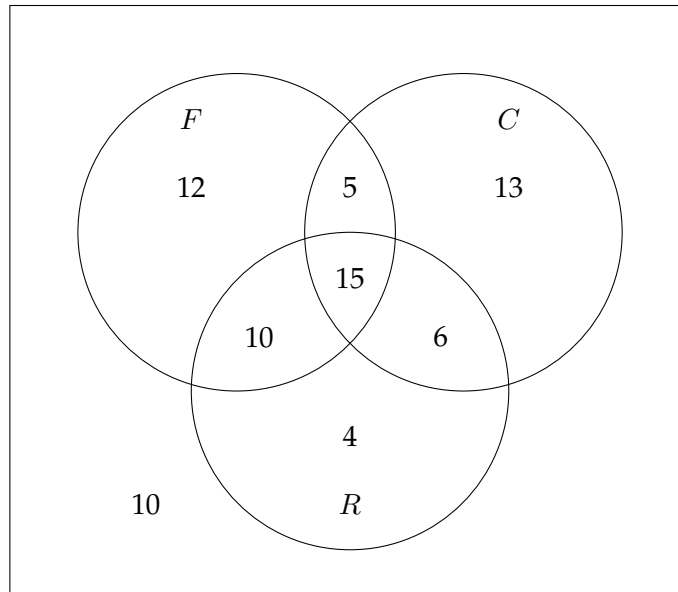
35 families brought crafts;

14 families brought crafts but not costumes;

10 families brought none of the three items;

18 families brought costumes but not crafts.

Suppose that F is the set of families brought food, C is the set of families brought costumes, and R is the set of families brought crafts. We can sketch the following Venn-diagram:



- (a) How many families brought costumes and food?
 $5 + 15 = 20$
- (b) How many families brought costumes?
 $5 + 15 + 6 + 13 = 39$
- (c) How many families brought food, but not costumes?
 $12 + 10 = 22$
- (d) How many families did not bring crafts?
 $10 + 12 + 5 + 13 = 40$
- (e) How many families brought food or costumes?
 $12 + 10 + 5 + 15 + 13 + 6 = 61$